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Title: Lengths of Full and Thinned ENDF/B-V Cross-Section Sets

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memorandum

TO: R. C. Little, X–6, MS B226

DATE: 16–January–1991

FROM: R. E. Seamon, X–6

MAIL STOP/TELEPHONE: B226 / 7–4809

SYMBOL: X–6:RES–91–29

SUBJECT: Lengths of Full and Thinned ENDF/B–V Cross–Section Sets

There are 76 evaluations from ENDF/B–V for which we have both full (".50C") and thinned (".51C") cross–section sets. Monday, John Hendricks questioned me about having so many thinned sets, because the thinned set is frequently only "four words" shorter than the full continuous–energy set. I was incredulous, but Hendricks turns out to be right again. The situation is slightly worse than he described, because rather than four words, the sets can differ in length by as little as zero words (5 cases).

In Table I I have listed the lengths of the full continuous–energy cross–section sets, those whose ZAIDs end in *.50C*, and the lengths of the corresponding thinned sets, those whose ZAIDs end in *.51C* . These lengths were taken from the directory /X6XS/CTSS/3/XSDIR3; each length is three words more than END, the twentieth word in the TRACE array. Table I is quite informative. Because of my surprise, I have looked at the fiche for each of the amazing .50C, .51C combinations. You can see from the fourth column that there is no difference in length for five ZAs. For ZA=15031 the files differ in length by only one word; this has been traced back to the expanded photon–production data. It is the difference between NJOY and ADDGAM processing, I believe. It should be mentioned that the files are NOT IDENTICAL from the COMPARE viewpoint. Not even the energy grids COMPARE favorably; they are always off by a couple of bits. Nevertheless, the fiche <u>are</u> the same; that shows you how close things are.

There are 27 ZAs for which one can really challenge the merit of carrying thinned sets. Two possibilities are summarized in the notes to Table I. If thinned cross sections with length differences less than 1000 are eliminated, we could remove 21% of the total thinned cross–section file. If instead of 1000 we used 5000 as the test criterion, then 33% of the total thinned file could be removed.

In Refs. 1 and 2 we suggested removing <u>168</u> ZAIDs from assorted libraries. If all the libraries were to be rewritten, we could save 948002 words. It is interesting that 55% of that saving could be effected simply by removing <u>27</u> *thinned* ENDF/B–V ZAIDs. The origin of the number 948002 is shown in Table II, which table is based on Table II from your Ref. 1.

There is another check on that number. For the ZAIDs remaining on each of the five files, we can calculate a total length. That length, plus the length of the deleted ZAIDs (=948002) should equal the total length of the current files, remembering to account for the directories of the five files.

File	Current Length	Length of Remaining ZAIDs
XMCCS3	798800	574052
AMCCS3	453685	276489
BMCCS3	826520	522047
UMCCS3	56647	50415
D93	557894	321531
	2693546	1744534

$$1744534 + 948002 + 5 \times 202 = 2693546$$

The cat chases his tail; all is consistent.

In the process of doing this job, it has become clear that the directories I proposed in Ref. 2 are NOT what we want. The proposed XSLIST has possible merit, but the directories are useless until all the files have been CULed and the individual directory lines rewritten. There is no merit whatever in simply weeding out the directory lines. We could use the directories of Ref. 2 temporarily to see if removal of any of the 168 ZAIDs would cause trouble with the users. If space savings are to be effected, the Type 1, Type 2, and Type 3 files for XMCCS, AMCCS, BMCCS, UMCCS, and D9 and all the associated directories must be rewritten. Small wonder that Ref. 2 was greeted with such deafening silence!

REFERENCES

1. R. C. Little, "MCNP Cross–Section Newsletter," Los Alamos National Laboratory internal memorandum X–6:RCL–86–286 to MCNP Distribution (July 11, 1986).
2. R. E. Seamon, "Cross Sections for MCNP Version 4," Los Alamos National Laboratory internal memorandum X–6:RES–90–294 to R. C. Little (May 17, 1990).

DISTRIBUTION

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RES:res

Table I

Comparing Lengths of Full and Thinned
Cross–Section Sets from ENDF/B–V

ZA	Length .50C	Length .51C	Difference		
1001	2830	2830	0	•	x
1002	4051	3981	70	•	x
1003	2472	2437	35	•	x
2003	2364	2364	0	•	x
2004	3105	2685	420	•	x
3006	9996	9199	797	•	x
3007	4928	4928	0	•	x
4009	8950	8076	874	•	x
5010	20264	18889	1375		x
5011	4388	4196	192	•	x
6000	23390	23070	320	•	x
7014	45521	45400	121	•	x
8016	38006	37999	7	•	x
9019	44194	41506	2688		x
11023	52316	48927	3389		x
12000	56398	48981	7417		
13027	54226	53441	785	•	x
14000	98673	88193	10480		
15031	5797	5796	1	•	x
16032	6853	6844	9	•	x
17000	23377	21148	2229		x
19000	22115	18862	3253		x
20000	62688	53436	9252		
22000	54865	31896	22969		
23000	38376	34174	4202		x
24000	134518	55680	78838		
25055	105157	25791	79366		
26000	115511	78380	37131		
27059	117139	28419	88720		
28000	139977	93639	46338		
29000	51914	51378	536	•	x
31000	7992	7992	0	•	x
40000	52108	16860	35248		
41093	129024	14739	114285		
42000	35698	10203	25495		
48000	19758	6778	12980		
56138	6082	6067	15	•	x
63151	68121	16799	51322		

63152	49357	10896	38461		
63153	55295	15466	39829		
63154	37052	10410	26642		
64152	26295	10973	15322		
64154	49616	11523	38093		
64155	45009	11922	33087		
64156	37415	11446	25969		
64157	39019	11368	27651		
64158	95920	11978	83942		
64160	54032	10024	44008		
73181	60804	21591	39213		
74182	94431	23262	71169		
74183	58863	22710	36153		
74184	58934	20634	38300		
74186	63765	21490	42275		
79197	139469	12286	127183		
82000	37697	37697	0	•	x
83209	15003	13785	1218		x
90232	152846	17989	134857		
91233	19563	5685	13878		
92233	18859	7757	11102		
92234	89477	6470	83007		
92235	60553	25865	34688		
92236	138759	7346	131413		
92237	32509	10381	22128		
92238	89062	23924	65138		
93237	63267	9790	53477		
94238	18807	6111	12696		
94239	74113	18901	55212		
94240	58981	15198	43783		
94241	38665	13467	25198		
94242	71493	15766	55727		
95241	42148	12438	29710		
95242	8657	8566	91	•	x
95243	92079	13748	78331		
96242	30961	9831	21130		
96244	46055	10911	35144		
	3837972	1561588	2276384		

The bullets (•) indicate ZAIDs in the ".51C" series with Difference under 1000; elimination of those 20 ZAIDs would remove 324946 words or 21% of the 1561588 total ".51C" length.

The crosses (x) indicate ZAIDs in the ".51C" series with Difference under 5000; elimination of those 27 ZAIDs would remove 522237 words or 33% of the 1561588 total ".51C" length.

1,433,634

Table II

Data Tables We Plan To Make Obsolete

ZAID	Length	ZAID	Length	ZAID	Length
From ENDL73					
1001.01C	3253	22000.01C	9262	74000.01D	4053
1002.01C	2125	22000.01D	3061	78000.01C	10316
1003.01C	1114	25055.01C	3589	78000.01D	3184
2003.01C	1323	25055.01D	3102	79197.01C	3564
2004.01C	1220	26000.01C	4105	82000.01C	3151
3007.01C	2790	28058.01C	5350	82000.01D	4059
4009.01C	3846	28058.01D	3532	90232.01C	4416
5001.01C	5061	29000.01C	3632	92233.01C	4782
5000.01D	4154	29000.01D	4430	92234.01C	2929
5010.01C	5362	31000.01C	3733	92235.01C	12961
5011.01C	1519	31000.01D	2910	92235.01D	5352
7014.01C	9589	41093.01C	5883	92236.01C	3330
8016.01C	5543	41093.01D	3273	92236.01D	4239
9019.01C	3104	42000.01C	5717	92237.01C	2679
9019.01D	4219	42000.01D	3953	92237.01D	3959
11023.01C	6819	48000.01C	7693	92238.01C	4856
11023.01D	5097	48000.01D	2974	92238.01D	5422
12000.01C	5140	50000.01C	2335	92239.01C	3396
13027.01C	3918	50000.01D	3128	92239.01D	4090
14000.01C	12374	50999.02C	1650	92240.01C	2954
14000.01D	4634	50999.02D	2843	92240.01D	4142
15031.01C	2845	56138.01C	2609	94238.01C	2787
15031.01D	3373	56138.01D	3204	94238.01D	3848
16032.01C	3255	63000.01C	3136	94239.01C	6256
16032.01D	3214	63000.01D	3020	94239.01D	6127
17000.01C	9857	64000.01C	3209	94240.01C	3832
18000.01C	2032	64000.01D	3081	94240.01D	4995
18000.01D	2878	67165.01C	3629	94241.01C	3618
19000.01C	7439	67165.01D	3292	94241.01D	4284
19000.01D	4133	73181.02C	18117	95242.01C	5950
20000.01C	9626	73181.02D	4375	95242.01D	3968
20000.01D	4460	74000.01C	3240		
					425882

Table II (concluded)

From ENDL75

40000.02C	10315	90232.10C	31412	92233.10D	4760
40000.02D	4314	90232.10D	4568	92234.10C	3187
79197.10C	19847	92233.10C	8136	92234.10D	4914
79197.10D	4676				
					96129

From ENDL76

1001.30C	1447	8016.30C	4568	41093.30D	5908
1003.30C	1029	8016.30D	4742	92235.30C	18125
2004.30C	1270	26000.30C	23182	92235.30D	5292
3006.30C	2943	26000.30D	4082	92238.30C	15257
6012.30C	2818	41093.30C	29728	92238.30D	6940
7014.30C	5151				
					132482

From LOS ALAMOS MASTER DATA FILE

1001.02C	2014	7014.02C	9214	29000.02C	6479
1002.02C	3010	8016.02C	4794	40000.01C	3840
1002.02D	4175	13027.02C	5535	40000.01D	2012
1003.02C	1486	22000.02C	3887	73181.01C	2434
2003.02C	821	24000.01C	3670	79197.02C	2663
2004.02C	1165	24000.01D	3557	82000.02C	2195
3006.01C	3446	28000.01C	5717	90232.02C	2636
3007.02C	3100	28000.01D	3379	94239.99C	4034
6012.01C	3101				
					88364

From ENDF/B–III

1001.03C	2462	3007.03C	3565	12000.02D	2877
1002.03C	1966	4009.02C	3324	13027.03C	18041
2001.01C	1708	5010.02C	2592	14000.02C	21635
2000.01D	2111	5011.02C	5137	14000.02D	6976
2003.03C	1520	5011.02D	2525	17000.02C	38374
2003.03D	2051	6012.02C	6945	17000.02D	8240
3006.02C	4000	12000.02C	3774		
					139823

From DNA

26000.03C	62889
	62889

From WEBSTER

6012.04C	2433
	2433

425882 + 96129 + 132482 + 88364 + 139823 + 62889 + 2433 = 948002